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CONTENTS

SUMMARY OF FEDERAL HIGHWAY LEGISLATION
INTRODUCED IN THE
FIRST SESSION OF THE SEVENTIETH CONGRESS

(NOT FOR RELEASE)

A SUMMARY OF THE FEDERAL HIGHWAY LEGISLATION INTRODUCED IN THE FIRST SESSION OF THE SEVENTIETH CONGRESS, WHICH ADJOURNED ON MAY 29, 1928, IS GIVEN BELOW. FOR READY REFERENCE PURPOSES, THE SUBJECT MATTER OF THE BILLS HAS BEEN BRIEFED, WHEREVER POSSIBLE. MORE DETAILED INFORMATION MAY BE OBTAINED, IF DESIRED, IN THE "PROGRESS OF FEDERAL HIGHWAY LEGISLATION" PUBLISHED IN THE ISSUES OF THE NEWS LETTER FROM DECEMBER 1927 TO MAY 1928. WHERE IT IS STATED IN CONNECTION WITH A BILL THAT "NO FURTHER ACTION WAS TAKEN", IT IS MEANT THAT THE LEGISLATIVE PROCEEDINGS WERE CARRIED NO FURTHER THAN AS DESCRIBED. HEARINGS, AND OTHER ACTION WHICH DID NOT ALTER THE OFFICIAL STATUS OF THE BILL MIGHT, HOWEVER, HAVE TAKEN PLACE. ALL BILLS WHICH HAVE BEEN SIGNED BY THE PRESIDENT AND HAVE BECOME LAWS ARE PRECEDED BY TWO ASTERISKS, FOR THE PURPOSE OF FACILITATING THEIR IDENTIFICATION.

S. 659.- INTRODUCED IN THE SENATE ON DECEMBER 6, BY KEY PITTMAN OF NEVADA, AND REFERRED TO THE COMMITTEE ON POST OFFICES AND POST ROADS. NO FURTHER ACTION TAKEN. PROVIDES THAT EXISTING FEDERAL-AID ROAD LEGISLATION BE AMENDED SO THAT ALL BUT THE PUBLIC-LAND STATES SHALL MAINTAIN FEDERAL-AID PROJECTS AT THEIR OWN EXPENSE. IN THE PUBLIC-LAND STATES THE FEDERAL SHARE OF THE MAINTENANCE COST SHALL BE IN THE SAME PROPORTION AS THE TOTAL AREA OF UNAPPROPRIATED PUBLIC LAND IN THE STATE BEARS TO THE TOTAL LAND IN THE STATE. PROVIDES FOR THE DISCONTINUANCE OF FEDERAL-AID PARTICIPATION IN THOSE STATES WHERE MAINTENANCE HAS BEEN NEGLECTED AFTER THE FEDERAL SHARE HAS BEEN MADE AVAILABLE, AND THE MAINTENANCE OF THE PROJECT BY THE FEDERAL GOVERNMENT, SUBJECT TO LATER REIMBURSEMENT.

S. 749.- INTRODUCED IN THE SENATE ON DECEMBER 6, BY H. BINGHAM OF CONNECTICUT, AND REFERRED TO THE COMMITTEE ON COMMERCE. NO FURTHER ACTION TAKEN. PROVIDES FOR THE AMENDMENT OF THE ACT TO REGULATE THE CONSTRUCTION OF BRIDGES OVER NAVIGABLE WATERS, APPROVED MARCH 23, 1906. THE AMENDMENT PROVIDES FOR THE FIXING OF TOLLS FOR PRIVATELY AND PUBLICLY-OWNED TOLL BRIDGES AND THE METHOD OF ESTIMATING THE COST FOR THE RECAPTURE OF THE PRIVATELY-OWNED TOLL BRIDGES BY PURCHASE.

S. 1182.- INTRODUCED IN THE SENATE ON DECEMBER 6, BY C. L. MCNARY OF OREGON. PASSED THE SENATE ON APRIL 8, AND REFERRED TO THE

House Committee on Roads on April 10, 1928. No further action taken. Authorizes the Secretary of Agriculture to cooperate with the State highway departments in selecting and assigning names to highways embraced in the Federal-aid system.

S. 1252.- Introduced in the Senate on December 6, by H. W. Watson of Pennsylvania, and referred to the Committee on Interstate Commerce. No further action taken. Provides for the regulation of interstate commerce of motor vehicles operating as common carriers of persons on the public highways. The bill is identical with H.R. 19 as described below.

S. 1286.- Introduced in the Senate on December 6, by A. Capper of Kansas, and referred to the Committee on Post Offices and Post Roads. No further action taken. Provides that existing Federal-aid highway legislation be amended by authorizing an appropriation of $50,000,000 for the fiscal year 1929, $65,000,000 for the fiscal year 1930, and $75,000,000 for the fiscal year 1931; to be expended in the improvement of rural post roads over which rural carriers travel in serving the rural routes, other than those now included in the Federal-aid road system. The funds are prorated to the States upon the basis of the mileage of rural routes, provided that the States appropriate a like amount, and administered in the same manner as the existing Federal-aid funds. See also S. 1925, S, 1945, H.R. 5659, H.R. 7351, H.R. 8834, and H.R. 9360.

**S. 1341.- Introduced in the Senate on December 6, by T. L. Oddie of Nevada. Passed the Senate on March 2, 1928. Amended and passed by the House on May 12, 1928. On May 15 the Senate agreed to the House amendments. The bill was signed by the President on May 21, 1928, as Public Law No. 458. The amended bill provides that section 11 of the Federal Highway Act, approved November 9, 1921, be amended by adding at the end of the second paragraph language providing that: (1) In those States where the public lands exceed 5 per cent of the total area of the State, and where the population does not exceed 10 per square mile of area, the United States share on Federal-aid highway projects may be increased up to the whole cost of the work, provided the State, during the same fiscal year spends, upon another project or projects in the Federal-aid system, the amount it would have been required to spend upon the original project; (2) the planting and maintenance of shade trees on the Federal-aid system is authorized; (3) the

FEDERAL-AID SYSTEM MAY EXCEED 7 PER CENT OF THE MILEAGE IN THE STATE BY THE TOTAL MILEAGE OF ROADS IN ALL FEDERAL RESERVATIONS; AND, (4) FEDERAL FUNDS MAY BE SPENT IN TOWNS WITH A POPULATION OF 2,500 OR MORE UNDER CERTAIN CONDITIONS. SEE ALSO H.R. 129, AND H.R. 9859.

**S. 1369.- INTRODUCED IN THE SENATE ON DECEMBER 6, BY C. A. SWANSON OF VIRGINIA. SIGNED BY THE PRESIDENT ON MAY 24, 1928, AS PUBLIC NO. 493. AUTHORIZES AND DIRECTS, UNDER THE JURISDICTION OF THE SECRETARY OF AGRICULTURE, THE SURVEY, CONSTRUCTION, AND MAINTENANCE OF A MEMORIAL HIGHWAY TO CONNECT MOUNT VERNON WITH THE ARLINGTON MEMORIAL BRIDGE ACROSS THE POTOMAC RIVER AT WASHINGTON. AUTHORIZES THE APPROPRIATION OF THE FOLLOWING SUMS TO BE AVAILABLE UNTIL EXPENDED; $500,000, FOR THE FISCAL YEAR 1928; $2,000,000, FOR THE FISCAL YEAR 1929; $1,000,000, FOR EACH OF THE FISCAL YEARS 1930, AND 1931. THIS BILL IS IDENTICAL WITH H.R. 4625.

S. 1718.- INTRODUCED IN THE SENATE ON DECEMBER 15, BY T. L. ODDIE OF NEVADA. REPORTED OUT WITHOUT AMENDMENT BY THE COMMITTEE ON POST OFFICES AND POST ROADS, ON APRIL 13, 1928. NO FURTHER ACTION TAKEN. AUTHORIZES THE PRESIDENT TO DETAIL ENGINEERS OF THE BUREAU TO ASSIST THE GOVERNMENTS OF THE LATIN-AMERICAN REPUBLICS IN HIGHWAY MATTERS, UPON APPLICATION BY THE GOVERNMENTS CONCERNED. THIS BILL IS IDENTICAL WITH H.R. 7344.

S. 1804.- INTRODUCED IN THE SENATE ON DECEMBER 15, BY T. J. WALSH OF MONTANA, AND REFERRED TO THE COMMITTEE ON POST OFFICES AND POST ROADS. NO FURTHER ACTION TAKEN. PROVIDES THAT THE MONTANA FEDERAL-AID ROAD FUNDS, FOR THE FISCAL YEARS 1924, AND 1925, WHICH REMAIN UNEXPENDED AT THE EXPIRATION OF THE LEGAL TIME LIMIT, SHALL NOT BE REAPPORTIONED TO THE OTHER STATES, AS PROVIDED BY LAW; BUT SHALL BE EXPENDED BY THE SECRETARY OF AGRICULTURE IN THE CONSTRUCTION OF A ROAD FROM RED LODGE, MONT., SO AS TO CONNECT WITH THE EXISTING HIGHWAY INTO YELLOWSTONE NATIONAL PARK, LEADING TO COOKE CITY, MONT.

S. 1806.- INTRODUCED IN THE SENATE ON DECEMBER 15, BY T. J. WALSH OF MONTANA, AND REFERRED TO THE COMMITTEE ON POST OFFICES AND POST ROADS. NO FURTHER ACTION TAKEN. AUTHORIZES THE SECRETARY OF AGRICULTURE TO PAY TO ROOSEVELT COUNTY, MONT., AN AMOUNT EQUIVALENT TO THAT EXPENDED BY THE COUNTY PRIOR TO NOVEMBER 9, 1921, FOR THE CONSTRUCTION OF THE ROOSEVELT HIGHWAY ACROSS THE UNPATENTED INDIAN LANDS WITHIN THE FORT PECK INDIAN RESERVATION. THIS BILL IS IDENTICAL WITH H.R. 7355.

S. 1900.- Introduced in the Senate on December 17, by G. H. Moses (for Mr. duPont) of New Hampshire. Reported out by the Committee on Post Offices and Post Roads on May 4, 1928, without amendment. No further action taken. Provides for the organization of a National Survey Commission for the construction of a post road and military highway from a point along the Atlantic seaboard to the Pacific Coast. The right of way is to be 500 feet wide. A study and report is to be made on certain highways connecting with the central superhighway.

S. 1925.- Introduced in the Senate on December 17, by L. D. Tyson of Tennessee, and referred to the Committee on Post Offices and Post Roads. No further action taken. This bill is identical with H.R. 5659 as described below except that $50,000,000 is authorized to be appropriated for each of the fiscal years 1929, and 1930, and no authorization is made for 1931. See also S. 1286, S. 1945, H.R. 5659, H.R. 7351, H.R. 8834, and H.R. 9360.

S. 1945.- Introduced in the Senate on December 19, by K. McKellar of Tennessee. Reported out with amendments by the Committee on Post Offices and Post Roads on April 12, 1928. No further action taken. The bill as amended provides that existing Federal-aid highway legislation be amended by authorizing an appropriation of $50,000,000 for each of the fiscal years 1931, and 1932, only; to be expended in the improvement of rural post roads over which rural carriers travel in serving the rural routes, other than those now included in the Federal-aid road system. The funds are prorated to the States upon the basis of the mileage of rural routes, provided that the States appropriate a like amount, and are administered in the same manner as the existing Federal-aid road funds. See also S. 1286, S. 1925, H.R. 5659, H.R. 7351, H.R. 8834, and H.R. 9360.

**S. 2327.- Introduced in the Senate on January 9, by L. C. Phipps of Colorado. Passed by both Houses, and signed by the President, on May 28, 1928, as Public No. 519. Authorizes the appropriation of $75,000,000 and $7,500,000 for Federal-aid, and forest roads, respectively, for each of the fiscal years 1930, and 1931. This bill is identical with H.R. 383 as noted below.

S. 2427.- Introduced in the Senate on January 9, by C. C. Dill of Washington, and referred to the Committee on the Judiciary. No further action taken. Proposes to enact supplemental section 8853-1 to section 8853 of the General Code relative to public railroad crossings of highways, and to provide that

DRIVERS OR OCCUPANTS OF VEHICLES AT SUCH CROSSINGS GUILTY OF CONTRIBUTORY NEGLIGENCE SHALL NOT BE BARRED A RECOVERY.

S. 2475.- INTRODUCED IN THE SENATE ON JANUARY 11, BY W. L. JONES OF WASHINGTON AND REPORTED OUT, WITH AN AMENDMENT, BY THE COMMITTEE ON COMMERCE, ON APRIL 18, 1928. NO FURTHER ACTION TAKEN. THE BILL AS AMENDED PROPOSES TO CREATE A PROSPERITY RESERVE AND STABILIZE INDUSTRY AND EMPLOYMENT BY THE EXPANSION OF PUBLIC WORKS DURING PERIODS OF UNEMPLOYMENT AND INDUSTRIAL DEPRESSION. IN ADDITION TO THE AMOUNTS NORMALLY AND USUALLY APPROPRIATED, IT AUTHORIZES AN APPROPRIATION OF $75,000,000 FOR FEDERAL-AID ROADS. NO APPROPRIATION IS TO BE MADE IN PURSUANCE TO THIS ACT UNTIL THE PRESIDENT COMMUNICATES TO CONGRESS THAT THE VOLUME, BASED UPON VALUE, OF CONTRACTS AWARDED FOR CONSTRUCTION WORK IN THE UNITED STATES, HAS FALLEN 10 PER CENT FOR A THREE-MONTH PERIOD BELOW THE AVERAGE OF THE CORRESPONDING THREE-MONTH PERIODS OF THE PRECEDING THREE YEARS.

S. 2699.- INTRODUCED IN THE SENATE ON JANUARY 17, BY F. L. GREENE OF VERMONT, AND REFERRED TO THE COMMITTEE ON COMMERCE. AUTHORIZES AN APPROPRIATION OF $2,654,000 FOR THE RELIEF OF VERMONT ON ACCOUNT OF THE DAMAGE AND DESTRUCTION OF ROADS AND BRIDGES BY THE RECENT FLOOD AND PROVIDES THAT THE AUTHORIZATION SHALL BE SPENT IN ACCORDANCE WITH THE PROVISIONS OF THE FEDERAL HIGHWAY ACT, WITH CERTAIN LIMITATIONS. THIS APPROPRIATION WAS INCLUDED IN THE AGRICULTURAL APPROPRIATION BILL ON MARCH 29, 1928.

S. 3081.- INTRODUCED IN THE SENATE ON FEBRUARY 8, BY M. SHEPPARD OF TEXAS, AND REFERRED TO THE COMMITTEE ON POST OFFICES AND POST ROADS. NO FURTHER ACTION TAKEN. PROVIDES THAT SECTION 21 OF THE FEDERAL HIGHWAY ACT BE AMENDED SO AS TO PROVIDE FUNDS FOR HIGHWAY RESEARCH UNDER THE DIRECTION OF THE SECRETARY OF WAR.

S. 3184.- INTRODUCED IN THE SENATE ON FEBRUARY 13, BY B. CUTTING OF NEW MEXICO, AND REFERRED TO THE COMMITTEE ON POST OFFICES AND POST ROADS. NO FURTHER ACTION TAKEN. PROVIDES FOR THE AMENDMENT OF EXISTING FEDERAL-AID ROAD LEGISLATION, BY AUTHORIZING AN APPROPRIATION OF $3,500,000 FOR EACH OF THE FISCAL YEARS 1929, 1930, AND 1931, FOR THE CONSTRUCTION AND MAINTENANCE BY THE BUREAU, OF THE MAIN ROADS IN THE PUBLIC-LAND STATES, THROUGH UNAPPROPRIATED OR UNRESERVED PUBLIC LANDS, NON-TAXABLE INDIAN LANDS, OR OTHER FEDERAL RESERVATIONS. THIS BILL IS SIMILAR TO H.R. 7343. SEE ALSO S. 3674.

S. 3559.- Introduced in the Senate on March 8, by J. E. Watson of Indiana, and referred to the Committee on Post Offices and Post Roads. No further action taken. Provides that the proceeds from the sale of surplus war material and supplies to the Government of France, amounting to $407,341,145 be used for the construction of Federal-aid and forest roads, and park roads in the District of Columbia. This bill is identical with H.R. 10142.

S. 3674.- Introduced in the House on March 19, by T. L. Oddie of Nevada. Passed by both Houses, and vetoed by the President on May 18, 1928. Repassed by the Senate on May 24, but failed to pass the House, over the President's veto, on May 25, 1928. Amends existing Federal-aid road legislation and authorizes an appropriation of $3,500,000 for each of the fiscal years 1929, 1930, and 1931, for the construction of roads on the Federal-aid system in the public-land States. These sums are in addition to the other Federal aid authorized to be appropriated, and no contribution from the States shall be required in the expenditure thereof.

S. 3874.- Introduced in the Senate on April 3, by T. J. Walsh of Montana, and reported out by the Committee on Post Offices and Post Roads, without amendment, on April 25, 1928. No further action taken. Authorizes an appropriation of $1,943,200 for the construction of a highway from Red Lodge, Mont., to the boundary of Yellowstone National Park near Cooke City, Mont.

S. 3992.- Introduced in the Senate on April 9, by J. E. Watson of Indiana, and referred to the Committee on Interstate Commerce, No. further action taken. This bill is identical with H.R. 12380. Provides for the regulation of motor vehicles operating in interstate commerce as common carriers of persons on the public highways.

S. 4440.- Introduced in the Senate on May 3, by J. E. Watson of Indiana, and referred to the Committee on Post Offices and Post Roads. No. further action taken. This bill is a modification of H.R. 10142 providing for the creation of a special highway fund out of the proceeds from the sale of surplus war material, highway equipment, and supplies to the Government of France for which the United States holds bonds totalling $407,341,145. See also S. 3559 above and H.R. 13323 below.

S. 4578.- Introduced in the Senate on May 3, by J. T. Robinson of Arkansas, and referred to the Committee on Agriculture and

FORESTRY. NO FURTHER ACTION TAKEN. AUTHORIZES THE APPROPRIATION OF $3,654,000 FOR THE RELIEF OF THE STATES OF MISSOURI, MISSIPPI, LOUISIANA, AND ARKANSAS IN THE MATTER OF ROADS AND BRIDGES DAMAGED OR DESTROYED BY THE FLOODS OF 1927. THIS BILL IS IDENTICAL WITH H.R. 14067 AS DESCRIBED BELOW.

S.J. RES. 19.- INTRODUCED IN THE SENATE ON DECEMBER 6, BY C. L. MCNARY OF OREGON AND REFERRED TO THE COMMITTEE ON AGRICULTURE AND FORESTRY. NO FURTHER ACTION TAKEN. PROVIDES FOR DESIGNATING THE ROUTE OF THE OREGON TRAIL FROM INDEPENDENCE, MO., TO SEASIDE, ORE., AND TO OLYMPIA, WASH.

**S.J. RES. 30.- INTRODUCED IN THE SENATE ON DECEMBER 12, BY L. C. PHIPPS OF COLORADO. PASSED BY BOTH HOUSES, AND SIGNED BY THE PRESIDENT, ON APRIL 4, 1928, AS PUBLIC RES. NO. 24. AUTHORIZES AN APPROPRIATION OF $15,000 FOR THE EXPENSES INCIDENT TO THE PARTICIPATION BY THE UNITED STATES IN THE SECOND PAN AMERICAN CONFERENCE ON HIGHWAYS TO BE HELD AT RIO DE JANEIRO.

**S.J. RES. 31.- INTRODUCED IN THE SENATE ON DECEMBER 12, BY L. C. PHIPPS OF COLORADO. PASSED BY BOTH HOUSES, AND SIGNED BY THE PRESIDENT, ON MARCH 29, 1928, AS PUBLIC RES. NO. 18. AUTHORIZES AND REQUESTS THE PRESIDENT TO EXTEND TO THE PERMANENT INTERNATIONAL ASSOCIATION OF ROAD CONGRESSES AN INVITATION TO HOLD THE SIXTH SESSION IN THE UNITED STATES, EITHER IN 1929, OR 1930. ALSO AUTHORIZES TO BE APPROPRIATED THE SUM OF $25,000 FOR THE EXPENSES OF SUCH SESSION AS MAY NECESSARILY BE INCURRED BY THE GOVERNMENT OF THE UNITED STATES.

S.J. RES. 138.- INTRODUCED IN THE SENATE ON APRIL 26, BY A. CAPPER OF KANSAS, AND REFERRED TO THE COMMITTEE ON AGRICULTURE AND FORESTRY. NO FURTHER ACTION TAKEN. PROVIDES FOR THE DESIGNATION OF THE ROUTE OF THE NATIONAL OLD TRAILS ROAD AND THE PLACING OF MARKERS THEREON.

H.R. 18.- INTRODUCED IN THE HOUSE ON DECEMBER 5, BY E. E. DENISON OF ILLINOIS, AND REFERRED TO THE COMMITTEE ON ROADS. NO FURTHER ACTION TAKEN. PROVIDES THAT THE EXISTING FEDERAL-AID ROAD LIGISLATION SHALL NOT BE CONSTRUED SO AS TO PROHIBIT THE GRANTING OF FEDERAL-AID FUNDS TO A ROAD OR HIGHWAY WHICH LEADS TO OR FROM A TOLL BRIDGE OR TOLL FERRY.

H.R. 19.- INTRODUCED IN THE HOUSE ON DECEMBER 5, BY E. E. DENISON OF ILLINOIS, AND REFERRED TO THE COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE. NO FURTHER ACTION TAKEN. PROVIDES FOR THE REGULATION OF INTERSTATE COMMERCE BY MOTOR VEHICLES OPERATING AS COMMON CARRIERS OF PERSONS ON THE PUBLIC HIGHWAYS.

H.R. 107.- Introduced in the House on December 5, by O. B. Burtness of North Dakota, and referred to the Committee on Interstate and Foreign Commerce. No further action taken. Provides regulations for the construction of bridges over navigable waters of the United States, and for other purposes.

H.R. 129.- Introduced in the House on December 5, by J. M. Evans of Montana, and referred to the Committee on Roads. No further action taken. Provides for increasing the share of the United States payable on Federal-aid projects in the public-land States. See also H.R. 9859 and section (1) of S. 1341 as amended.

H.R. 358.- Introduced in the House on December 5, by E. B. Almon of Alabama, and referred to the Committee on Roads. No further action taken. Authorizes the appropriation of $125,000,000 and $7,500,000, for Federal-aid, and forest roads, respectively, for each of the fiscal years 1930, and 1931.

H.R. 383.- Introduced in the House on December 5, by C. C. Dowell of Iowa, and referred to the Committee on Roads. Authorizes the appropriation of $75,000,000 and $7,500,000 for Federal-aid, and forest roads, respectively, for each of the fiscal years 1930, and 1931. S. 2327 passed in lieu thereof on May 21, 1928.

H.R. 447.- Introduced in the House on December 5, by C. J. McLeod of Michigan, and referred to the Committee on Foreign Affairs. No further action taken. Provides for the creation of a Pan American Peoples Great Highway Commission to promote the construction of a highway connecting the capitals of Canada, the United States, and the Central and South American countries.

H.R. 4625.- Introduced in the House on December 5, by R. W. Moore of Virginia, and reported without amendment by the Committee on Roads, on March 28, 1928. No further action taken. Authorizes appropriations, and directs under the jurisdiction of the Secretary of Agriculture, the survey, construction, and maintenance of a memorial highway to connect Mount Vernon with the Arlington Memorial Bridge across the Potomac River at Washington. See S. 1369.

H.R. 5518.- Introduced in the House on December 5, by D. B. Colton of Utah, and referred to the Committee on Roads. No further action taken. Provides for certain amendments to existing Federal-aid highway legislation. See the December, 1927, News Letter, page 17.

H.R. 5659.- Introduced in the House on December 5, by B. C. Reece of Tennessee, and referred to the Committee on Roads. No further action taken. This bill is similar to S. 1286 as described above. See also S. 1925, S. 1945, H.R. 7351, H.R. 8834, and H.R. 9360.

H.R. 5772.- Introduced in the House on December 5, by G.E. Campbell of Pennsylvania, and reported, without amendment, by the Committee on the Judiciary, on January 1, 1928. No further action taken. Provides that every Federal agency, before expending any funds for any construction project, estimated to cost more than $25,000, and not constituting maintenance or repair, shall prepare complete plans and specifications for such project, together with a detailed estimate of the entire cost.

**H.R. 5800.- Introduced in the Senate on December 12, Passed by both Houses, and signed by the President on December 22, 1928, as Public No. 2. This is the urgent deficiency bill. Provides for an additional amount for carrying out the provisions of section 23 of the Federal Highway Act, approved November 9, 1921, $1,880,000, to remain available until expended, being part of $7,500,000 authorized to be appropriated for the fiscal year 1928 by the act approved June 22, 1926. Provides $1,000,000 for the construction, reconstruction, and improvement of roads and trails in the national parks under the jurisdiction of the Department of the Interior. This is part of the authorization in the appropriation act of the Department of the Interior for the fiscal year 1928.

H.R. 6957.- Introduced in the House on December 12, by W. P. Holaday of Illinois, and referred to the Committee on Ways and Means. No further action taken. Provides for the construction, maintenance, and regulation of a nation-wide system of durable hard-surfaced post-roads under the supervision of the Secretary of Agriculture, to be completed within five years; and authorizes a bond issue of 5 billion dollars for this purpose.

H.R. 6992.- Introduced in the House on December 12, by James O'Connor of Louisiana, and referred to the Committee on Flood Control. No further action taken. Provides, among other things, for the expenditure of 25 million dollars by the Secretary of War, through the Corps of Engineers, in the flooded areas of the Mississippi River Valley, for channel stabilization and bank protection, the repair of flood protective works, public highways, post roads and bridges, and the repair and strengthening of levees.

H.R. 7016.- Introduced in the House on December 12, by H. R. Rathbone of Illinois, and referred to the Committee on Roads. No further action taken. Authorizes the construction and maintenance of a memorial highway from Springfield, Ill., - the burial place of Abraham Lincoln - to Beardstown, Ill., - the place of the famous Duff-Armstrong trial.

H.R. 7019.- Introduced in the House on December 12, by C. G. Edwards of Georgia, and referred to the Committee on Roads. No further action taken. Provides for the amendment of existing Federal-aid road legislation by authorizing an appropriation, for the construction of Federal-aid roads, of $150,000,000, for each of the fiscal years 1930, and 1931.

H.R. 7205.- Introduced in the House on December 13, by C. B. Hudspeth of Texas, and referred to the Committee on Roads. No further action taken. Authorizes an appropriation of $18,000,000 for the construction of a military road, paralleling the Mexican border, under the direction of the Secretary of War.

H.R. 7343.- Introduced in the House on December 14, by D. B. Colton of Utah, and referred to the Committee on Roads. No further action taken. Provides for the amendment of existing Federal-aid road legislation, by authorizing an appropriation of $3,500,000 for each of the fiscal years 1929, 1930, and 1931 for the construction, by the Bureau, of the main roads, in the public-land States, through unappropriated or unreserved public lands, non-taxable Indian lands, or other Federal reservations. S. 3674 substituted in lieu thereof on May 5, 1928.

H.R. 7344.- Introduced in the House on December 14, by C. C. Dowell, of Iowa, and referred to the Committee on Roads. No further action taken. Authorizes the President to detail engineers of the Bureau to assist the governments of the Latin-American republics in highway matters, upon application by the governments concerned. See S. 1718.

H.R. 7351.- Introduced in the House on December 14, by M. C. Tarver of Georgia, and referred to the Committee on Roads. No further action taken. Provides for the extension of Federal aid to rural free delivery and star mail routes which do not constitute portions of the present Federal-aid or State highway systems. See also S. 1286, S. 1925, S. 1945, H.R. 5659, H.R. 8834, and H.R. 9360.

H.R. 7355.- Introduced in the House on December 14, by Scott Leavitt of Montana, and referred to the Committee on Roads. No further action taken. Authorizes the Secretary of Agriculture to pay to Roosevelt County, Mont., an amount equivalent to that expended by the county prior to November 9, 1921, for the construction of the Roosevelt highway across the unpatented Indian lands within the Fort Peck Indian reservation. See S. 1806.

H.R. 7724.- Introduced in the House on December 16, by C. G. Edwards of Georgia, and referred to the Committee on Roads. No further action taken. Provides that preferenge shall be given to American materials and equipment in highway construction; with the purpose of breaking the hold of the foreign cement trust upon highway construction in this country, and building up American industries.

H. R. 7901.- Introduced in the House on December 19, by Frank Murphy of Ohio, and referred to the Committee on the Judiciary. No further action taken. Provides, in all legal actions arising from accidents at railway grade crossings, that no rule shall be adopted or laid down by the Federal Court of the United States contrary to the law of the State, Territory, or place where such accident occurred, but the law of the place where such accident occurred shall govern and be followed in all such causes of action.

H.R. 8127.- Introduced in the House on December 20, by A. M. Wyant of Pennsylvania, and referred to the Committee on Expenditures in the Executive Departments. No further action taken. Provides for the transfer to the Department of the Interior of the public-works functions of the Federal Government.

**H.R. 8269.- Passed by both Houses, and signed by the President on February 15, 1928, as Public No. 32. Makes appropriations for the Departments of State and Justice and for the Judiciary, and for the Departments of Commerce and Labor, for the fiscal year ending June 30, 1929, and for other purposes. Makes an appropriation of $3,000 to pay the quota of the United States in the Permanent Association of International Road Congresses, as authorized by the public resolution approved June 18, 1926.

H.R. 8294.- Introduced in the House on January 4, by Scott Leavitt of Montana, and referred to the Committee on Roads. No further action taken. Authorizes an appropriation

of $2,153,000 for the construction of a highway from Red Lodge, Mont., to the boundary of the Yellowstone National Park near Cooke City, Mont.,

H.R. 8832.- Introduced in the House on January 7, by R. W. Moore of Virginia, and referred to the Committee on Roads. No further action taken. Provides for the amendment of existing Federal highway legislation to authorize an appropriation of $150,000,000 for Federal-aid roads for each of the fiscal years 1930, and 1931; and an additional sum of $15,000 (sic) for forest roads and trails, under section 23, for each of the fiscal years 1930, and 1931.

H.R. 8834.- Introduced in the House on January 7, by W. F. Stevenson of South Carolina, and referred to the Committee on Roads. No further action taken. Provides that existing Federal-aid highway legislation be amended by authorizing an appropriation of $50,000,000 for each of the fiscal years 1929, and 1930; to be expended in the improvement of rural post roads over which rural carriers travel in serving the rural routes, other than those now included in the Federal-aid road system. See also S. 1286, S. 1925, S. 1945, H.R. 5659, H.R. 7351, and H.R. 9360.

H.R. 9360.- Introduced in the House on January 16, by H. P. Fulmer of South Carolina, and referred to the Committee on Roads. No further action taken. This bill is identical with H.R. 8834 as described above. See also S. 1286, S. 1925, S. 1945, H.R. 5659, and H.R. 7351.

H.R. 9767.- Introduced in the House on January 20, by E. W. Gibson of Vermont, and referred to the Committee on Roads. No further action taken. Authorizes an appropriation of $2,654,000 for the relief of Vermont on account of the damage and destruction of roads and bridges by the recent flood. On March 29, this appropriation was included in the agricultural appropriation bill.

H.R. 9846.- Introduced in the House on January 23, by R. H. Clancy of Michigan, and referred to the Committee on Roads. No further action taken. Provides that existing Federal-aid highway legislation be amended by authorizing an appropriation of $100,000,000 for each of the fiscal years 1930, and 1931; and an additional sum of $7,500,000 for forest roads and trails, under section 23, for each of the fiscal years 1930, and 1931.

H.R. 9854.- Introduced in the House on January 23, by J. M. Robsion of Kentucky, and referred to the Committee on Roads. No further action taken. This bill is identical with H.R. 9846 as described above.

H.R. 9859.- Introduced in the House on January 23, by D. B. Colton of Utah, and referred to the Committee on Roads. No further action taken. Provides for increasing the share of the United States on Federal-aid projects in the public-land States by adding a new paragraph at the end of section 11 of the existing Federal-aid highway legislation. See also H.R. 129, and Section (1) of S. 1341 as amended.

H.R. 10142.- Introduced in the House on January 30, by E. E. Browne of Wisconsin, and referred to the Committee on Roads. No further action taken. Provides that the proceeds from the sale of surplus war material, highway equipment, and supplies to the Government of France for which the United States holds bonds totalling $407,341,145, is authorized to be appropriated for the construction of Federal-aid and forest roads. See S. 3559 as described above.

H.R. 10565.- Introduced in the House on February 6, by J. M. Robsion of Kentucky, and referred to the Committee on Roads. No further action taken. Authorizes an appropriation of $1,831,794 for the relief of Kentucky on account of the damage and destruction of roads and bridges by the recent flood. This appropriation was included in the agricultural appropriation bill on March 29, 1928.

H.R. 10800.- Introduced in the House on February 10, by W. W. Hastings of Oklahoma, and referred to the Committee on Roads. No further action taken. Authorizes an appropriation of $230,000 for the relief of Oklahoma on account of the damage and destruction of roads and bridges by the recent flood.

H.R. 10864.- Introduced in the House on February 13, by F. Hale of New Hampshire, and referred to the Committee on Roads. No further action taken. Authorizes an appropriation of $653,300 for the relief of New Hampshire on account of the damage and destruction of roads and bridges by the recent flood. On March 29, 1928, this appropriation was included in the agricultural appropriation bill.

H.R. 10879.- Introduced in the House on February 13, by J. Crail of California, and referred to the Committee on Roads. No further action taken. Authorizes an appropriation of $250,000 for the preparation of plans and reports, relative to the establishment of a Pacific Coast National Highway system, under the supervision of the Secretary of War.

H.R. 11209.- Introduced in the House on February 20, by O. B. Burtness of North Dakota, and referred to the Committee on Roads. No further action taken. Provides for the amendment of Section 2 of the Federal Highway Act by redefining the term "Highway," as follows: "The term 'Highway' includes rights of way, bridges, drainage structures, signs, guard rails, and protective structures in connection with highways, but shall not include any highway or street in a municipality having a population of two thousand five hundred or more as shown by the last available census, except that portion of any such highway or street along which the houses average more than two hundred feet apart."

H.R. 11210.- Introduced in the House on February 20, by O. B. Burtness of North Dakota, and referred to the Committee on Roads. No further action taken. Provides for the amendment of existing Federal-aid highway legislation with reference to the construction of bridges within municipalities.

H.R. 11280.- Introduced in the House on February 21, by L. C. Warren of North Carolina and referred to the Committee on Roads. No further action taken. Authorizes an appropriation of 10 million dollars as an emergency relief fund to be expended by the Secretary of Agriculture in the repair of highways or bridges damaged or destroyed by floods.

H.R. 11464.- Introduced in the House on February 27, by Tom Connally of Texas, and referred to the Committee on Roads. No further action taken. Provides that section 21 of the Federal Highway Act be amended so as to provide funds for highway research under the direction of the Secretary of War. This bill is identical with S. 3081.

H.R. 11485.- Introduced in the House on February 27, by E. E. Denison of Illinois, and referred to the Committee on Interstate and Foreign Commerce. No further action taken. Provides for the amendment of the act regulating the construction of bridges over navigable waters as approved March 23, 1906.

**H.R. 11577.- Passed by both Houses, and signed by the President on May 16, 1928, as Public No. 392. This is the agricultural appropriation bill for the fiscal year ending June 30, 1929. Appropriates for forest roads and trails, under section 23 of the Federal Highway Act, $6,500,000 which is composed of $3,945,000 part of the sum of $7,500,000 authorized to be appropriated for the fiscal year 1928 by the act approved June 22, 1926, and $2,555,000 part of the amount authorized to be appropriated for the fiscal year 1929, by the act approved June 22, 1926. Also provides that upon the approval of this act the $7,500,000 available for forest roads for the fiscal year 1929 shall be apportioned and prorated. For building Federal-aid roads there is appropriated $71,000,000. This sum is composed of $27,800,000, the remainder of the $75,000,000 authorized for the fiscal year ending June 30, 1927; and $43,200,000, part of the $75,000,000 authorized for the fiscal year ending June 30, 1928

H.R. 12040.- Introduced in the House on March 13, by C. G. Edwards of Georgia, and referred to the Committee on Roads. No further action taken. Provides that the Federal-aid highways shall be named as well as numbered on maps and directional signs in order to perpetuate the purposes of such memorials.

H.R. 12380.- Introduced in the House on March 24, by J. S. Parker of New York, and referred to the Committee on Interstate and Foreign Commerce. No further action taken. Provides for the regulation of motor vehicles operating in interstate commerce as common carriers of persons on the public highways.

H.R. 12385.- Introduced in the House on March 24, by D. B. Colton of Utah, and referred to the Committee on Roads. No further action taken. Provides for certain amendments to the existing Federal-aid road legislation. See the April, 1928, News Letter, pages 22-23.

H.R. 13111.- Introduced in the House on April 17, by R. G. Simmons of Nebraska, and referred to the Committee on Roads. No further action taken. Provides for the amendment of section 6 of the Federal-aid highway act of November 9, 1921 so as to connect national cemeteries with the Federal-aid highway system.

H.R. 13323.- Introduced in the House on April 25, by E. E. Browne of Wisconsin, and referred to the Committee on Roads. No further action taken. This bill is a modification of H.R. 10142.

H.R. 13460.- Introduced in the House on May 1, by H. R. Rathbone of Illinois, and referred to the Committee on Roads. No further action taken. This bill is similar to S. 1900 as described above.

H.R. 13751.- Introduced in the House on May 14, by H. R. Rathbone of Illinois, and referred to the Committee on Roads. No further action taken. This bill is a modification of H.R. 7016.

H. R. 14067.- Introduced in the House on May 28, by W. J. Driver of Arkansas, and referred to the Committee on Agriculture. No further action taken. Authorizes the appropriation of $3,654,000 for the relief of the States of Missouri, Mississippi, Louisiana, and Arkansas in the matter of roads and bridges damaged or destroyed by the floods of 1927.

H.R. 14134.- Introduced in the House on May 29, by O. S. Ware of Kentucky, and referred to the Committee on Interstate and Foreign Commerce. No further action taken. Provides amendments to the Act entitled "An Act to regulate the construction of bridges over navigable waters" approved March 23, 1906.

H.J. Res. 107.- Introduced in the House on December 16, by J. C. Linthicum of Maryland, and reported, without amendment, by the Committee on Foreign Affairs, on January 24, 1928. No further action taken. S.J. Res. 31, as described above, was substituted for this bill.

H.J.Res. 108.- Introduced in the House on December 16, by J. C. Linthicum of Maryland, and reported, without amendment, by the Committee on Foreign Affairs, on January 24, 1928. No further action taken. S.J. Res 30, as described above, was substituted for this bill.

H.J. Res. 121.- Introduced in the House on January 4, by C. C. Dowell of Iowa, and referred to the Committee on Roads. No further action taken. This bill is identical with S.J.Res. 30 as described above.

H.J. Res. 136.- Introduced in the House on January 6, by C. C. Dowell or Iowa, and referred to the Committee on Roads. No further action taken. Provides for the creation of a Pan American Highway Commission. See the January, 1928, News Letter, page 32.

H.J. Res. 252.- Introduced in the House on March 27, by C. Cole of Iowa, and referred to the Committee on Foreign Affairs. No further action taken. Authorizes the assistance of the United States Government in the construction of an Inter-American highway in the Western Hemisphere.

**H.J. Res. 256.- Introduced in the House on March 28, by W. J. Sears of Florida, and referred to the Committee on Roads. Passed by both Houses, and signed by the President on May 16, 1928, as Pub. Res. No. 40. Authorizes the Bureau to make a survey to determine the cost of certain bridges on United States Route 1, and its extension from the Florida mainland to Key West. This resolution was substituted for H. Res. 117, as described below.

**H.J. Res. 259.- Introduced in the House on April 2, by C. J. McLeod of Michigan, Passed by both Houses, and signed by the President on May 4, 1928, as Public Res. No. 40. Authorizes the assistance of the United States Government in the construction of an Inter-American highway in the Western Hemisphere.

H. Res. 103.- Introduced in the House on January 26, by A. Johnson of Washington, and referred to the Committee on Roads. No further action taken. Authorizes and directs the Speaker of the House to appoint a special committee to investigate and inquire into all facts in relation to the designation of the existing system of numbered United States highways.

H. Res. 117.- Introduced in the House on February 20, by W. J. Sears of Florida, and referred to the Committee on Roads. No further action taken. On April 11, 1928, H.J. Res. 256, as described above, was substituted for this resolution.

H. Res. 119.- Introduced in the House on February 21, by E. Celler of New York, and referred to the Committee on Labor. No further action taken. Provides that the President shall authorize the heads of all departments and bureaus to speed up all Government building and construction, in order to reduce the amount of unemployment.

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF PUBLIC ROADS

STATUS OF CURRENT FEDERAL-AID ROAD WORK

FOR THE FISCAL YEAR ENDING JUNE 30, 1928

AS OF MAY 31, 1928

STATES	BALANCE OF FEDERAL-AID FUND AVAILABLE FOR NEW PROJECTS	*UNDER CONSTRUCTION			APPROVED FOR CONSTRUCTION			AMOUNT PAID STATES DURING FISCAL YEAR	COMPLETED AND PAID DURING FISCAL YEAR			AGREEMENTS NOW IN FORCE			P. S. & E. RECOMMENDED FOR APPROVAL BY DISTRICT ENGINEER			STATES
		FEDERAL AID	MILEAGE		FEDERAL AID	MILEAGE			FEDERAL AID	MILEAGE		FEDERAL AID	MILEAGE		FEDERAL AID	MILEAGE		
			ORIGINAL	STAGE		ORIGINAL	STAGE			ORIGINAL	STAGE		ORIGINAL	STAGE		ORIGINAL	STAGE	
Alabama	$ 1,924,599.30	$ 3,818,049.46	429.8	57.8	$ 131,597.45	30.0		$ 2,356,762.04	$ 1,954,811.85	230.2		$ 3,445,128.91	361.7	57.8	$ 603,518.00	98.1		Alabama
Arizona	2,955,748.98	944,453.75	90.4	4.3	902,121.27	29.7	0.6	422,436.01	483,822.73	16.1		945,406.32	87.3	4.9	901,179.70	32.8		Arizona
Arkansas	1,789,890.67	2,393,168.62	227.4		276,457.71	33.3	6.2	670,958.55	180,778.05	37.5		2,207,771.33	213.6		461,852.20	47.1	6.2	Arkansas
California	4,103,636.68	3,154,337.16	137.3	8.2	233,995.74	15.1		2,104,217.13	2,583,670.60	128.5	0.4	3,123,338.69	140.6	8.2	264,994.21	11.8		California
Colorado	2,730,799.85	3,163,017.79	223.3	9.2	237,614.45	24.1		1,257,583.00	1,020,002.00	101.9	3.2	2,604,539.58	194.5	9.2	798,092.68	52.9		Colorado
Connecticut	606,727.61	1,285,131.44	53.5		165,551.17	10.2		415,289.33	779,159.24	40.9		1,369,158.16	58.3		81,534.45	5.4		Connecticut
Delaware	190,680.44	130,093.50	6.0	4.0	155,295.80	13.0		383,665.84	383,665.84	39.8		109,376.47	6.0	2.1	176,012.83	13.0	1.9	Delaware
Florida	1,325,672.07	2,439,933.13	150.9	5.5	269,730.00	18.0		1,141,781.18	2,222,468.20	94.6	24.7	2,343,383.90	134.5	5.5	366,279.23	34.4		Florida
Georgia	41,270.54	2,707,448.89	231.6	61.3	1,090,246.53	94.4	40.0	1,997,922.03	3,450,978.54	255.5	124.1	2,610,657.76	223.6	61.3	1,187,037.66	104.4	40.0	Georgia
Idaho	313,429.72	1,122,208.37	119.6	43.9	650,114.77	74.6	14.7	854,487.75	1,266,501.98	152.8	34.1	830,897.42	73.7	34.6	941,425.72	120.7	24.0	Idaho
Illinois	424,474.47	8,782,552.71	582.4		3,149,739.09	231.2		2,614,411.28	983,569.12	74.6		6,719,055.81	468.1		5,213,235.19	345.5		Illinois
Indiana	253,748.70	5,656,409.55	363.5		1,549,275.74	113.0	3.5	2,618,920.80	3,354,587.81	230.3		5,309,057.66	342.8	3.5	1,896,627.63	133.7		Indiana
Iowa	220,724.32	2,601,549.38	167.0	115.1	1,478,473.09	22.5	99.0	3,401,514.18	4,869,502.46	454.5	129.4	3,733,600.04	176.8	208.7	346,522.43	12.7	5.4	Iowa
Kansas	1,846,513.63	4,043,663.61	516.6		165,000.00	38.5		2,948,567.99	2,809,132.28	408.9	17.6	3,866,523.92	494.4		342,139.69	59.7		Kansas
Kentucky	635,391.33	3,650,121.51	316.2	25.9	586,181.72	61.8		2,138,172.81	1,659,395.59	175.7	53.5	3,363,264.45	298.8	25.9	853,038.87	79.2		Kentucky
Louisiana	317,320.15	2,905,221.59	224.9	7.5	134,880.31	5.7		795,355.30	853,683.74	68.2		2,493,327.62	180.1	7.5	546,774.28	50.6		Louisiana
Maine	1,461,705.93	539,062.25	40.0		235,085.39	19.9		469,884.28	732,748.76	61.7		609,557.53	48.0		164,590.11	11.9		Maine
Maryland	280,116.23	248,300.00	22.5		388,030.00	34.8	7.2	555,948.88	756,597.50	79.6		199,100.00	22.5		435,230.00	34.8	7.2	Maryland
Massachusetts	2,291,206.80	1,700,483.55	105.1		252,879.21	16.1		647,981.29	816,136.29	39.7		1,649,550.10	102.4		303,812.66	18.8		Massachusetts
Michigan	620,379.62	5,597,426.52	332.0		1,147,452.71	62.8	6.5	2,230,278.93	3,072,908.16	215.5	12.6	3,841,452.02	239.3		2,903,427.21	155.3	6.5	Michigan
Minnesota	398,471.43	1,974,100.00	306.4	47.1	405,000.00	51.6	28.2	1,986,635.11	2,001,398.90	248.7	110.3	2,270,100.00	342.0	75.3	109,000.00	16.0		Minnesota
Mississippi	1,009,368.36	2,908,402.65	252.2	47.2	100,385.84	16.3		1,645,057.87	1,723,174.53	206.5	19.8	2,188,715.91	216.7	12.0	820,072.58	51.8	35.2	Mississippi
Missouri	1,850,310.19	3,149,406.38	236.0	34.1	544,224.99	32.6	28.1	2,543,485.17	2,370,969.96	186.8	30.5	2,520,214.72	197.2	17.5	1,173,418.65	71.4	44.7	Missouri
Montana	4,369,927.68	2,652,517.14	316.7	4.1	1,512,255.72	254.3	10.7	1,565,369.41	707,070.77	88.5	9.2	3,565,561.02	497.1	5.4	599,211.64	73.9	9.4	Montana
Nebraska	1,979,842.38	5,030,670.77	976.2	381.6	115,525.91	15.5	34.8	2,456,408.50	2,939,928.65	651.3	490.8	5,137,295.71	991.7	416.4	8,900.87			Nebraska
Nevada	631,978.59	1,687,954.11	208.8	52.0	213,239.91	40.9	17.0	880,537.75	579,378.71	80.9	10.7	1,646,776.82	206.8	45.9	264,417.20	40.8	33.1	Nevada
New Hampshire	153,317.25	405,531.23	26.7		126,322.36	5.2		370,277.50	426,543.11	30.7		399,681.45	22.6		132,272.14	9.3		New Hampshire
New Jersey	253,177.00	1,185,211.52	79.7		294,270.00	19.6		1,109,130.00	1,109,130.00	74.0		904,141.52	59.3		575,340.00	40.0		New Jersey
New Mexico	1,177,794.46	2,840,410.50	255.7	15.3	510,293.61	56.1	0.4	1,389,517.28	882,413.37	99.9		2,458,560.34	195.1	0.4	892,143.77	116.7	15.3	New Mexico
New York	4,738,516.02	7,486,491.45	467.1		2,240,497.50	145.8	8.6	4,697,885.48	5,150,830.38	333.5		9,192,238.95	577.2	6.5	534,750.00	35.7		New York
North Carolina	1,259,070.22	699,258.43	47.3	6.8	825,912.82	52.8	23.4	1,474,088.07	1,843,327.37	134.4	27.6	739,758.43	48.2	6.8	785,412.82	51.9	23.4	North Carolina
North Dakota	794,240.32	1,975,098.00	646.1	213.9	542,315.99	221.8	163.2	1,353,781.64	2,079,102.01	497.4	342.1	2,170,222.97	700.4	313.0	347,191.02	187.5	84.1	North Dakota
Ohio	3,054,516.85	4,039,701.13	259.0	5.9	1,702,976.26	99.8	6.7	2,035,998.30	3,123,398.00	243.3	4.2	3,982,261.13	260.1	5.9	1,760,416.26	98.7	6.7	Ohio
Oklahoma	645,594.26	2,653,976.95	384.6	12.8	1,138,474.24	138.2	14.0	1,397,128.71	1,007,109.34	91.4	30.3	2,569,898.09	371.6	12.8	1,220,553.10	131.2	14.0	Oklahoma
Oregon	1,258,918.82	1,342,062.38	73.9	9.2	245,435.21	7.2		592,996.38	363,388.85	16.6	32.6	1,408,718.47	78.6	9.2	178,779.12	2.5		Oregon
Pennsylvania	2,362,883.91	5,144,298.34	314.8		1,232,657.78	79.2		2,617,487.08	2,950,841.65	198.6	3.0	5,268,496.48	323.3		1,108,459.64	70.6		Pennsylvania
Rhode Island	571,636.73	313,732.41	19.1		212,075.80	11.7		309,076.72	302,895.00	20.2		452,557.41	28.3		73,250.80	2.5		Rhode Island
South Carolina	73,458.43	2,642,353.00	272.6	157.6	277,700.00	38.2	23.6	863,638.87	1,395,544.77	81.0	7.7	2,475,285.89	265.0	137.8	444,768.11	43.8	43.5	South Carolina
South Dakota	751,144.17	2,212,383.55	707.0	118.4	284,127.15	97.0	43.6	944,552.74	845,654.58	257.3	104.6	2,173,620.35	722.3	121.0	322,690.38	81.7	40.9	South Dakota
Tennessee	620,823.66	3,632,288.37	241.3	23.8	1,212,204.88	22.9	84.3	1,073,015.74	1,590,594.64	98.3	36.5	2,753,784.10	193.0	23.8	2,090,709.15	71.2	84.3	Tennessee
Texas	4,547,418.36	6,074,802.03	444.6	203.1	2,334,758.22	126.1	176.4	4,104,022.53	5,082,339.94	402.3	196.8	5,849,973.31	457.3	237.9	2,559,586.94	113.4	141.6	Texas
Utah	208,287.83	1,300,653.13	110.4	7.0	692,375.69	48.9	5.9	1,231,886.45	1,545,361.40	161.5	7.5	1,216,758.11	108.6	7.0	774,270.71	52.5	5.9	Utah
Vermont	179,564.57	576,351.99	45.1		2,000.00	1.4		694,117.53	892,994.43	48.7		358,178.76	22.9		220,175.21	23.6		Vermont
Virginia	347,039.66	1,609,761.29	113.1	17.7	744,362.93	56.4	10.1	1,355,897.18	1,243,468.87	67.5		1,359,517.13	118.2	10.4	894,607.09	55.3	17.4	Virginia
Washington	757,843.46	722,600.00	79.9		989,236.89	52.9	23.1	521,599.31	1,704,301.70	85.8		1,355,600.00	115.8	18.1	358,238.89	17.0	5.0	Washington
West Virginia	647,002.36	1,650,581.28	164.3	4.0	202,594.91	21.2		1,043,717.00	1,668,016.44	122.2	8.0	1,845,460.36	164.3	4.0	206,715.83	21.2		West Virginia
Wisconsin	1,731,132.09	3,519,372.03	304.1	24.9	701,284.33	44.0	15.8	2,959,014.72	3,373,834.65	274.0	26.4	2,231,821.76	197.6	18.6	1,988,834.50	160.5	21.9	Wisconsin
Wyoming	227,967.45	1,525,234.58	230.9	78.8	355,851.58	67.3		911,183.34	1,191,869.34	119.2	55.7	1,296,832.22	222.5	63.4	585,253.94	75.7	15.4	Wyoming
Hawaii	1,063,238.15	239,100.89	12.3		58,504.63	1.8		319,832.19	373,119.33	20.6		239,100.89	12.3		58,504.63	1.8		Hawaii
TOTALS	61,918,409.61	128,175,045.81	11,916.9	1,618.0	33,014,597.21	2,775.4	895.5	74,700,491.30	84,509,256.33	7,825.6	1952.9	121,428,178.80	11,581.2	2000.4	39,761,464.02	3,111.1	713.1	TOTALS

* Includes projects reported completed (final vouchers not yet paid) totaling: Federal aid, $ 29,995,622.60 Mileage: Original 2,960.0 Stage 549.8

PRESSURE JETTING AS AN AID TO THE SETTLEMENT OF FILLS

CONTRIBUTED BY
J. H. STONE OF THE DIVISION OF DESIGN

PRESSURE JETTING AS THE MOST EFFECTIVE METHOD FOR ACCELERATING THE SETTLEMENT OF EMBANKMENTS, SO AS TO EXPEDITE PAVING OPERATIONS, HAS BEEN SELECTED BY ILLINOIS, KANSAS, MISSOURI, AND OKLAHOMA, BASED UPON EXPERIMENTS MADE DURING THE LAST FEW YEARS. THE NECESSITY OF WAITING FOR A PERIOD RANGING FROM 6 MONTHS TO TWO YEARS FOR HIGHWAY FILLS TO SETTLE HAS OFTEN PROVED A SERIOUS HANDICAP TO TRAFFIC, ESPECIALLY WHERE THE AFFECTED SECTIONS WERE RELATIVELY SHORT. FURTHERMORE, DRY FILLS OF APPRECIABLE DEPTH, EVEN WHEN CAREFULLY CONSTRUCTED IN ROLLER-COMPACTED, FULL-HORIZONTAL LAYERS, CANNOT BE DEPENDED UPON TO SUPPORT PROPERLY A PAVEMENT LAID DURING THE SAME SEASON. ANY PROVEN CONSTRUCTION METHOD, THEREFORE, WHICH REDUCES THE DURATION OF THE "CLOSED-TO-TRAFFIC" PERIOD WILL EFFECT A CORRESPONDING SAVING IN VEHICLE MILES TO ROAD USERS.

DETAILS OF PRACTICE AND SPECIFICATIONS FOR THE PRESSURE-JETTING OPERATION HAVE BEEN WORKED OUT BY THESE STATES FROM OBSERVATIONS MADE ON EXPERIMENTAL AND ACTUAL CONSTRUCTION PROJECTS. OF THE SEVERAL STANDARD SPECIFICATIONS THAT HAVE BEEN DEVELOPED, THE FOLLOWING SEEM TO BE CONFIRMED MOST FULLY BY THE RESULTS OF THE OBSERVATIONS AND THEY ALSO ARE BELIEVED TO BE BEST ADAPTED FOR FEDERAL-AID PROJECTS.

SPECIFICATIONS FOR PRESSURE JETTING OF FILLS

DESCRIPTION.- THIS ITEM, CONSISTING OF PRESSURE JETTING OF FILLS, SHALL BE PERFORMED AT LOCATIONS INDICATED ON THE PLANS AND IN ACCORDANCE WITH DIRECTIONS GIVEN BY THE ENGINEER. THE WORK SHALL BE DONE NOT LESS THAN 6 WEEKS IN ADVANCE OF THE LAYING OF THE PAVEMENTS, OR AS MUCH SOONER AS PRACTICABLE, AND IN STRICT CONFORMITY WITH THE TYPICAL SECTIONS SHOWN ON THE PLANS AND WITH THE FOLLOWING SPECIFICATIONS.

CONSTRUCTION METHODS.- IN CASE JETTING IS NOT BEGUN WITHIN 10 DAYS AFTER THE COMPLETION OF THE ROUGH GRADING, THE HARD EARTH CRUST FORMED ON THE FILLS BY TRAFFIC OR OTHER CAUSES, SHALL BE PLOWED THOROUGHLY FOR A DISTANCE OF 10 FEET ON EACH SIDE OF THE CENTER LINE OF THE ROAD BEFORE THE WATER JETS ARE APPLIED.

PRESSURE JETTING OF FILLS SHALL BE ACCOMPLISHED WITH A ONE-INCH PIPE, HAVING THE NOZZLE END TAPERED TO A ONE-HALF-INCH HOLE. THE PRESSURE OF WATER AT THE NOZZLE, WHEN IN OPERATION, SHALL NOT BE LESS THAN 60 POUNDS PER SQUARE INCH. THE JET HOLES SHALL FIRST BE OPENED BY SPUDDING, WITH A HEAVY IRON BAR, TO A DEPTH OF 3 FEET, AND SHALL BE SPACED NOT FURTHER THAN 5 FEET APART ON CENTERS. INTO THESE HOLES THE JET NOZZLE, UNDER FULL PRESSURE, SHALL BE INSERTED. AS LONG AS THE FILL CONTINUES TO ABSORB WATER, THE JET SHALL BE KEPT IN THE HOLE, AND IT SHALL NOT BE FORCED TO THE BOTTOM OF THE FILL UNTIL THE WATER BEGINS TO OVERFLOW THE TOP OF THAT HOLE, OR OF ADJACENT HOLES. IF A HOLE MUST BE TEMPORARILY ABANDONED, BECAUSE OF THE LEAKAGE OF WATER FROM THE FILL, THE JET SHALL AGAIN BE APPLIED TO IT AFTER THE ADJACENT HOLES HAVE BEEN JETTED.

THE JETTING SHALL BEGIN AT THE DEEPEST AND PROCEED TOWARD THE SHALLOWEST PART OF THE FILL.

ARCHING OF THE SURFACE OF THE FILL SHALL BE WATCHED FOR, CONTINUALLY, AND WHEREVER FOUND THE CRUST SHALL BE BROKEN.

NOT LESS THAN 2 WEEKS IN ADVANCE OF THE PAVING, THE CONTRACTOR SHALL BACK FILL ALL HOLES WITH SUITABLE MATERIAL THOROUGHLY SATURATED DURING THE BACKFILLING.

IT IS UNDERSTOOD THAT ANY DELAYS IN THE CONTRACTOR'S OPERATIONS, CAUSED BY THE PRESSURE JETTING, SHALL BE COVERED BY THE UNIT PRICE BID FOR JETTING UNDER THIS SPECIFICATION.

METHOD OF MEASUREMENT.- THE YARDAGE TO BE PAID FOR SHALL BE THE NUMBER OF CUBIC YARDS OF ACCEPTED JETTED FILLS, MEASURED, IN PLACE, 2 WEEKS AFTER THE JETTING HAS BEEN COMPLETED. THE LENGTH OF FILL PAID FOR SHALL INCLUDE THE DISTANCE BETWEEN END CROSS SECTIONS HOLED AND JETTED, PLUS 10 FEET.

BASIS OF PAYMENT.- THE YARDAGE OF JETTED FILL, MEASURED AS PROVIDED ABOVE, SHALL BE PAID FOR AT THE UNIT PRICE BID PER CUBIC YARD FOR "PRESSURE JETTING OF FILLS". THIS PRICE SHALL BE FULL COMPENSATION FOR FURNISHING ALL WATER, PUMPS, PIPE LINES AND APPURTENANCES, LABOR, EQUIPMENT, TOOLS, AND FOR THE PAYMENT OF WATER ROYALTIES, AND ALL OTHER INCIDENTALS NECESSARY TO COMPLETE THE ITEM.

Other Hydraulic Methods Also Investigated

Besides pressure jetting, other hydraulic methods for accelerating the settlement of embankments have been tried and the results indicate their value. In Missouri both the "post-hole" and the "ponding" methods were investigated.

In 1925, using the post-hole operation, fills were consolidated on 26 miles of road, in Missouri, and the pavement was laid, during the same season, from 4 to 6 weeks after the completion of the work. Holes, spaced $2\frac{1}{2}$ feet apart, were dug through the fill to the surface of the original soil. These holes were kept full of water for 5 days. For purposes of comparison one fill was left unwatered. Reporting on this particular experiment in his paper presented before the American Road Builder's Association, in January, 1927, Mr. T. H. Cutler, chief engineer of the Missouri State Highway Department, commented as follows: -

"All fills 4 feet and over, except one, on this section of road, were jetted; the fill which was not jetted was 8 feet in height, and a failure occurred within 2 months after the pavement was laid on this particular fill. There was no sign of failure of the pavement due to settlement on any of the other fills that were jetted, even after a period of more than one year. There was, however, a slight settlement of one 5-foot fill near a culvert. This fill was only 5 feet deep for a short distance, and there was probably some negligence on the part of the jetting force. A number of 8-foot fills and some 20-foot fills have not settled during the last 2 years. At least, there is no noticeable defect in the concrete pavement that was laid soon after the jetting was completed."

Mr. H. H. Lotter, of this Bureau, who has kept in close touch with the fill consolidation work in Missouri, in his special report submitted at the request of the headquarter's office, comments on the above mentioned 26 miles of construction as follows: -

"Many clays and sandy soils, including those with light loose rock formation took an even settlement.

"Clay in large lumps settled when wet but formed arches under the surface which could be broken down only by vigorous manipulation such as deep heavy plowing.

"MORE WATER WAS LOST THROUGH THE SIDE SLOPES OF FILLS COMPOSED CHIEFLY OF LARGE CHUNKS THAN FROM FILLS COMPOSED OF MEALY SOILS.

"SETTLEMENT WAS GENERALLY LESS IN THE CASE OF FILLS COMPOSED OF HARD CLAYS THAN IN THE CASE OF FILLS OF MEALY SOILS.

"IF A FILL WAS SCARIFIED OR PLOUGHED UPON COMPLETION OF A WATERING OPERATION, DRENCHING BY RAIN PRODUCED A FURTHER SETTLEMENT; HOWEVER, NO SETTLEMENT HAS THUS FAR DEVELOPED WHERE THE SURFACE WAS SO SCARIFIED OR PLOUGHED SUBSEQUENT TO WATERING BUT WHERE NO WETTING BY RAIN WAS EXPERIENCED.

"WHERE, AS IN THE CASE OF HARD CLAYS MIXED WITH LOOSE ROCK, IT WAS DIFFICULT, AND SO IMPRACTICAL, TO DIG HOLES, SATURATION OF THE FILL BY JETTING SEEMED TO PRODUCE THE SAME EFFECT AS REGARDS SETTLEMENT AS DID THE METHOD OF DIGGING HOLES AND FILLING THEM WITH WATER.

"WHEN CRACKS WERE NOT PRODUCED WHERE THEY MIGHT REASONABLY HAVE BEEN EXPECTED, AS IN A FILL OF SIX FEET OR MORE, ARCHING OF THE FILL WAS SURE TO HAVE TAKEN PLACE. FROM OBSERVATIONS MADE IN DUG HOLES IT WAS FOUND THAT THE ARCHING EFFECT BEGAN ABOUT A FOOT BELOW THE SURFACE OF THE SUBGRADE."

THE MISSOURI STANDARD SPECIFICATIONS, ISSUED NOVEMBER 1, 1926, PRESCRIBE THE POST-HOLE METHOD OF FILL CONSOLIDATION IN THE FOLLOWING LANGUAGE:

"HOLES 6 INCHES IN DIAMETER SHALL FIRST BE BORED WITH A POST-HOLE AUGER OR OTHER SUITABLE TOOL, OR TOOLS, FROM THE ELEVATION OF THE SUBGRADE TO A POINT 12 INCHES ABOVE THE ORIGINAL GROUND LINE, AS SHOWN ON THE CROSS SECTION, PRIOR TO MAKING THE FILL. SUCH HOLES SHALL BE SPACED 5 FEET, CENTER TO CENTER, OR AS SHOWN ON THE TYPICAL SECTION ATTACHED TO THE PLANS.

"SUCH HOLES SHALL THEN BE FILLED WITH WATER AND KEPT CONTINUOUSLY FILLED WITH WATER FOR A PERIOD OF NOT LESS THAN 56 HOURS, OR FOR SUCH A PERIOD AS THE ENGINEER SHALL DEEM NECESSARY TO INDUCE QUICK SETTLEMENT AND COMPACTION OF THE FILL. CARE MUST BE TAKEN IN FILLING THE HOLES WITH WATER SO THAT THE STREAM OF WATER IS NOT UNDER HEAVY PRESSURE AND NOT DIRECTED AGAINST THE SIDE WALL OF THE HOLE; PROPER CARE SHALL BE TAKEN AT ALL TIMES TO AVOID ARCHES. WATER SHALL BE PUMPED INTO EACH HOLE AT A RATE NOT TO EXCEED 5 GALLONS PER MINUTE. WHILE THE HOLES ARE BEING KEPT FILLED WITH WATER FOR THE PERIOD OF TIME NOTED, THE INTERVENING TOP SURFACE OF THE FILL BETWEEN THE HOLES SHALL BE KEPT SATURATED AT ALL TIMES BY PONDING."

Bid prices noted for the post-hole method range from seven to ten cents per cubic yard.

Ponding Method Tried In Missouri

Regarding the ponding method, as tried in Missouri in 1926, Mr. Lotter's report continues as follows:-

"By way of further investigation a ponding experiment was carried out. This differed from the method first above described in that the holes then dug extended entirely through the fill to the old ground beneath. With the ponding method trenches were dug in lieu of holes because of the difficulty in making excavations of small diameter. These trenches were 12 feet long and 4 feet wide and extended longitudinally of the road in three rows, one on the center line and the others one on each side near the shoulder (fig. 1). A six-foot space was left between successive trenches in the same row and the trenches in each row were staggered transversely so as not to leave in any instance an unbroken surface for the full width of the roadbed. The center row of trenches was dug to one-half the depth of the fill while the side rows extended to but one-quarter of the depth, the theory being that the center trench would saturate wedge-shaped in cross section thus requiring a greater volume of water, while the outside trenches would be required to saturate only a cross section resembling a parallelogram and somewhat smaller. This theory appeared to work out well in practice.

"About 12 hours was required for the water to disappear from the trenches after the first filling; with a second filling approximately half had soaked away in 24 hours. Subsequently but little water was required to keep the holes filled as sediment appeared to tend to seal the trench walls. No water was added after the first week and at the end of three weeks the trenches were still about one-quarter full. At this time the trenches were backfilled and water-soaked, practically all of the excavated material going back into them. Soaking of the refilled trenches did not appear to produce any further settlement.

"Consolidation by this method was quite uniform and seemed to stop at about the fourth day. The side slopes began to show water about 12 hours after the trenches were filled and became uniformly wet after another 12 hours. They were still

Fig. 1. - The ponding method using 3 rows of staggered trenches each 12 feet long and 4 feet wide

Fig. 2. - At times it is necessary for the operator to force the pipe down by his own weight

DAMP AFTER THREE WEEKS HAD ELAPSED. MEASUREMENTS TAKEN SHOWED THAT THE SETTLEMENT BY THIS METHOD WAS ABOUT 8 PER CENT FOR THAT PART OF THE FILL OVER 4 FEET, OR 2 PER CENT LESS THAN THAT SECURED BY THE JETTING PROCESS."

THE COST OF THE PONDING METHOD IS ESTIMATED TO BE SLIGHTLY LESS THAN THE PRESSURE JETTING.

EFFECTIVENESS AND LIMITATIONS OF PRESSURE-JETTING METHOD.

EXAMINATION OF THE ROUTINE REPORTS OF VARIOUS FEDERAL-AID PROJECTS IN SEVERAL STATES ESTABLISHES THE FACT THAT A CONSIDERABLE MILEAGE OF CONCRETE PAVEMENT HAS BEEN LAID ON FILLS CONSTRUCTED AND PRESSURE JETTED DURING THE SAME SEASON. THE REPORTS INDICATE THAT THE FILLS WERE ROLLED. THE SPECIFICATIONS ALSO REQUIRED THAT THE FILLS SHOULD BE CONSTRUCTED IN FULL-WIDTH HORIZONTAL LAYERS. UNDER FAVORABLE WEATHER CONDITIONS, PAVEMENTS WERE LAID 4 TO 6 WEEKS AFTER THE FILLS WERE COMPLETELY JETTED AND AFTER ONE TO TWO YEARS SHOWED NO EVIDENCE OF RUPTURE DUE TO THE UNEVEN SETTLEMENT. THERE IS NO EVIDENCE AT HAND TO JUSTIFY THE OMISSION OF THE USUAL STRICT REQUIREMENTS FOR LAYER CONSTRUCTION AND ROLLING, AND TO RELY UPON JETTING ALONE.

MR. C. M. HATHAWAY, ENGINEER OF CONSTRUCTION OF THE ILLINOIS STATE DIVISION OF HIGHWAYS, REPORTING ON PRESSURE JETTING WORK IN THE ENGINEERING NEWS-RECORD OF MARCH 11, 1926, STATES THAT HE FOUND "BY CAREFUL LEVEL READINGS, THAT NEARLY ALL ACTION (SETTLEMENT) TAKES PLACE WITHIN THE FIRST 48 HOURS." LIKEWISE MR. CUTLER, IN THE PAPER ABOVE REFERRED TO, COMMENTS AS FOLLOWS ON RESULTS OBTAINED BY THE PRESSURE-JETTING METHOD IN THE EXPERIMENTAL WORK OF 1926:

"VERY LITTLE EFFECTS WERE NOTED FROM RAIN WHICH FELL PRIOR TO THE JETTING, ALTHOUGH THERE OCCURRED THREE LIGHT RAINS, AND ONE HEAVY RAIN DURING WHICH 7.18 INCHES OF WATER FELL IN 40 HOURS. THE JETTING WAS DONE ON 5-FOOT CENTERS, THE HOLES BEING FIRST SPUDDED ABOUT 3 FEET DEEP WITH A HEAVY CROWBAR.

"AFTER PLATTING THE CROSS SECTIONS TAKEN DURING A PERIOD OF THREE WEEKS, THE DEPARTMENT FOUND THAT VERY LITTLE SETTLEMENT OCCURRED LATER THAN 48 HOURS AFTER JETTING. SEVERAL OF THE FILLS WHICH SHOWED HEAVY SETTLEMENTS WERE CHECKED FOR SIDE-SLOPE BULGING. THE SETTLEMENT WAS FOUND TO BE UNIFORM FROM THE SHOULDER TO THE TOE OF THE SLOPE; NO BULGING EFFECT SHOWED IN ANY CASE.

DATA WERE KEPT AND COMPARED FOR EVERY FILL ON 7 MILES OF WORK, WITH FILLS VARYING FROM 1 FOOT TO 14 FEET IN HEIGHT."

REFERRING TO THE PRESSURE-JETTING METHOD, MR. LOTTER FURTHER DESCRIBES THE ACTION OF THE FILLS AND GIVES DETAILS CONCERNING THE EQUIPMENT AND THE CONSTRUCTION METHODS AS FOLLOWS:

"OBSERVATIONS MADE ON UNWATERED FILLS SHOWED THAT RAIN HAD BUT LITTLE EFFECT IN SETTLING THEM AND THAT THE SLIGHT DIFFERENCES IN ELEVATION OBSERVED WERE MAINLY DUE TO THE WASHING OF THE SURFACE, A SITUATION MOST NOTICEABLE ON THE SHOULDERS. MEASUREMENTS SHOWED THAT THE SIDE SLOPES AFTER A HEAVY RAIN BUILT UP AT THE TOE AN AVERAGE OF 0.4 TO A FOOT.

"THE EQUIPMENT IN PRESSURE JETTING (FIGS. 2 AND 3) CONSISTS PRIMARILY OF A 1-INCH PIPE, OF A LENGTH APPROPRIATE FOR THE DEPTH OF FILL, CONNECTED TO A WATER HOSE. THE FREE END OF THE PIPE IS DRAWN DOWN SO THAT THE OPENING IS CONSTRICTED TO ABOUT A HALF-INCH IN DIAMETER. THIS INCREASES THE VELOCITY OF THE WATER AS IT LEAVES THE PIPE AND PROMOTES THE EFFICIENCY OF THE JETTING. TO AVOID A KINKING OF THE HOSE NEAR ITS JUNCTION WITH THE PIPE, UNION IS MADE BY THE USE OF A T-CONNECTION. A VALVE NEAR THE UPPER END OF THE PIPE PERMITS SPRAYING OF THE ROAD SURFACE WITHOUT DELAY IN THE JETTING. IN ACTUAL USE WATER HAS BEEN PUMPED THROUGH A TWO-INCH PIPE AS FAR AS FOUR MILES WITH AN INITIAL PRESSURE OF ABOUT 160 POUNDS, GIVING FROM 60 TO 80 POUNDS PRESSURE AT THE NOZZLE.

"THE JETTING WAS DONE WITH HOLES AT FIVE-FOOT CENTERS, THE FIRST THREE FEET OR SO OF DEPTH BEING MADE WITH A HEAVY CROWBAR. AS IN ALL JETTING OPERATIONS, IT WAS AT TIMES NECESSARY TO FORCE THE PIPE DOWN BY THE WEIGHT OF THE OPERATOR (FIG. 2). THE PIPE WAS NEVER FORCED SO LONG AS THE FILL WAS TAKING WATER BUT WHEN THE HOLE HAD SUFFICIENT WATER, AS WAS EVIDENCED BY ITS RUNNING OVER, THE JET WAS MOVED TO A NEW HOLE AND THE OPERATION REPEATED. IF A HOLE LEAKED WATER AT THE BEGINNING OF THE OPERATION AND DID NOT STOP BY THE TIME THE JET HAD REACHED THE BOTTOM OF THE FILL, THE PIPE WAS MOVED TO ANOTHER HOLE FOR THE TIME BEING BUT LATER BROUGHT BACK IN AN ATTEMPT TO FILL THE LEAKY HOLE. IN APPROXIMATELY 75 PER CENT OF THE CASES HOLES SO TEMPORARILY ABANDONED WOULD NOT LEAK WHEN TRIED THE SECOND TIME.

"THE AVERAGE TIME NECESSARY TO JET A HOLE IN AN 8-FOOT FILL WAS 45 MINUTES ALTHOUGH SOME HOLES TOOK WATER FOR $2\frac{1}{2}$ HOURS.

Fig. 3. - Sixty pounds per square inch pressure or more should be maintained on the 1/2-inch nozzle of the jet

Fig. 4. - Overflow water may be trenched advantageously to other holes or cracks

WHEN IT TOOK A COMPARATIVELY LONG TIME TO JET A HOLE WITHOUT WATER RUNNING OUT OF THE SIDE SLOPES, THERE WOULD BE OTHER HOLES NEAR BY WHICH WOULD TAKE BUT VERY LITTLE WATER, SHOWING THAT THE GROUND FOR 10 OR 15 FEET AROUND THE ORIGINAL HOLE WAS ALREADY PARTLY SATURATED. SUCH SATURATION WAS READILY DISCLOSED BY DRIVING THE BAR INTO THE FILL NOT YET JETTED, THE BAR EASILY PENETRATING THE WET EARTH AFTER PIERCING THE DRY TOP-CRUST.

"IN THE PROCESS OF JETTING, THE OPERATION WAS SOMETIMES ADVANCED FROM THE CUT TOWARD THE CULVERT, OR DOWN GRADE, WHILE AT OTHER TIMES IT PROCEEDED FROM THE CULVERT TO THE CUT, OR UP GRADE. THE LATTER METHOD APPEARED TO GIVE THE BETTER RESULTS AS IT ALLOWED THE WATER TO SEEP CONTINUALLY INTO THE WETTED PORTION OF THE FILL; ALSO IT PERMITTED OVERFLOW WATER FROM ANY HOLE OR HOLES TO BE TRENCHED TO OTHER HOLES OR CRACKS, THUS TENDING TO KEEP THE TOP CRUST WET (FIG. 4). WATER WAS NOT PERMITTED TO RUN DOWN THE SIDE SLOPES SINCE IT WAS QUITE ESSENTIAL TO NOTE IF FREE WATER SHOULD BREAK THROUGH THE FILL. ONLY A FEW SUCH SIDE-SLOPE BREAKS WERE NOTED, THE SATURATION SEEMING USUALLY TO WORK OUTWARD UNIFORMLY UNTIL EVENTUALLY THE SIDE SLOPES BECAME QUITE MUDDY.

"QUAKING OF THE GROUND SOMETIMES OCCURRED, USUALLY AT OR JUST AHEAD OF THE JETTING. THIS SEEMED TO SHOW EITHER THAT THE FILL WAS WATERSOAKED OR THAT A LOWER PORTION HAD SETTLED AWAY FROM A TOP CRUST, LEAVING THE LATTER IN A RUBBERY CONDITION TO SETTLE FINALLY ON BECOMING SATURATED OR BY CRACKING. CRACKS FREQUENTLY APPEARED BOTH AHEAD OF AND IN THE REAR OF THE POINT OF JETTING, THE LARGEST CRACKS OCCURRING AT THE POINTS OF GREATEST SETTLEMENT.

"CAREFUL MEASUREMENTS MADE ON SEVERAL SECTIONS SHOWED THAT VERY LITTLE SETTLEMENT OCCURRED LATER THAN 48 HOURS AFTER JETTING. EXCAVATIONS MADE BETWEEN JETTED HOLES SHOWED THE SOIL TO BE WET TO WITHIN 8 TO 15 INCHES OF THE SURFACE AND NO SIGNS OF CAVITIES COULD BE FOUND. LIKE EXCAVATIONS MADE DURING THE JETTING OPERATION WOULD FILL WITH WATER.

"RECORDS WERE KEPT AND COMPARED ON SEVERAL MILES OF WORK WHERE THE FILLS VARIED IN HEIGHT FROM 1 TO 14 FEET. AN ANALYSIS OF THE SOIL INVOLVED GAVE THE FOLLOWING: ROCK 28 PER CENT, SAND 21 PER CENT, CLAY 51 PER CENT. FILLS OF 4 FEET OR LESS, EVEN AFTER SEVERAL MONTHS, SHOWED LITTLE IF ANY SETTLEMENT, AS A RESULT OF THE JETTING. FOR FILLS IN EXCESS OF FOUR FEET THERE APPEARED TO BE A SETTLEMENT AMOUNTING, ON THE AVERAGE, TO 10 PER CENT OF THE DEPTH OF THE FILL IN EXCESS OF FOUR FEET, THAT IS, A 6-FOOT FILL UPON JETTING SETTLED 0.2 OF A FOOT. WITH

MEALY CLAYS AND SOFTER SOILS THE SHRINKAGE WAS 15 PER CENT, WHILE OVER DEEP HOLES, WHERE END DUMPING WAS REQUIRED AND THE EARTH MORMONED INTO PLACE, THE SHRINKAGE RAN AS HIGH AS 25 PER CENT BUT USUALLY DID NOT EXCEED 20 PER CENT.

"FROM THE RECORDS KEPT IT WAS SHOWN THAT BY THE PRESSURE-JETTING METHOD 2.4 MINUTES WAS REQUIRED TO JET A CUBIC YARD OF FILL WHERE THE WATER FLOW IS 20 GALLONS PER MINUTE. THE COST, EXCLUSIVE OF SET-UP, REPAIRS, AND DEPRECIATION, WAS $4\frac{1}{2}$ CENTS PER CUBIC YARD. THIS FIGURE ALLOWS 50 CENTS PER HOUR FOR LABOR, $4.00 PER DAY OF 10 HOURS FOR GAS AND OIL, AND $1.40 PER DAY FOR THE PUMP OPERATOR."